Effect of Training on Adoption of Cancer Prevention Nutrition-Related Activities by Primary Care Practices: Results of a Randomized, Controlled Study

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OBJECTIVE: **The National Cancer Institute (NCI) developed a manual to guide primary care practices in structuring their office environment and routine visits so as to enhance nutrition screening, advice/referral, and follow-up for cancer prevention. The adoption of the manual's recommendations by primary care practices was evaluated by examining two strategies: physician training on how to implement the manual's recommendations versus simple mailing of the manual. This article reports on the results of a randomized controlled trial to evaluate the effectiveness of these two strategies.**

DESIGN: **A three-arm, randomized, controlled study.**

SETTING: **Free-standing primary care physician practices in Pennsylvania and New Jersey.**

INTERVENTION: **Each study practice was randomly assigned to one of three groups. The training group practices were invited to send one member from their practice of their choosing to a 3-hour "train-a-trainer" workshop, the manual-only-group practices were mailed the nutrition manual, and the control group practices received no intervention. For training group practices, training was provided in the four major components of the nutrition manual: how to organize the office environment to support cancer prevention nutrition-related activities; how to screen patient adherence to the NCI dietary guidelines; how to provide dietary advice/referral; and how to implement a patient follow-up system to support patients in making changes in their nutrition-related behaviors.**

MEASUREMENTS: **The primary outcomes of the study were derived from two evaluation instruments. The observation instrument documented the tools and procedures recommended by the nutrition manual and adopted in patient charts and the office environment. The in-person structured interview evaluated the physician and staff's self-reported nutrition-related activities reflecting the nutrition manual's recommendations. Data from these two instruments were used to construct four adherence scores corresponding to the areas: office organization, nutrition screening, nutrition advice/referral, and patient follow-up.**

MAIN RESULTS: **The adoption of the manual's recommendations was highest among the practices in the training group as reflected by their higher adherence scores. They organized their office ($P = .005$) and screened their patients regarding their eating habits ($P = .046$) significantly more closely to the recommendations of the nutrition manual than practices in the manual-only group. However, despite being the highest in compliance, the training group practices were only 54.9% adherent to the manual's recommendations regarding nutrition advice/referral, and 28.5% adherent to its recommendations on office organization, 23.5% adherent to its recommendations on nutrition screening, and 14.6% adherent to its patient follow-up recommendations.**

CONCLUSIONS: **Primary care practices exposed to the nutrition manual in a training session adopted more of the manual's recommendations. Specifically, practices invited to training were more likely to perform nutrition screening and to structure their office environment to be conducive to providing nutrition-related services for cancer prevention. The impact of the training was moderate and not statistically significant for nutrition advice/referral or patient follow-up, which are important in achieving long-term dietary changes in patients. The overall low adherence scores to nutrition-related activities demonstrates that there is plenty of room for improvement among the practices in the training group.**

KEY WORDS: **nutrition education; nutrition counseling; cancer prevention; primary care physicians.**
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Diet is an important factor in the cause and prevention of chronic diseases, including cancer.[1,2] Important strategies to reduce cancer risk have included major efforts to educate the U.S. public regarding the role of diet in cancer and to increase the number of primary care providers who counsel their patients regarding diet and health.[3]

Primary care providers are in a unique position to influence changes in the dietary habits of their patients.[4–8] Despite the clear need for physicians to advise their patients about nutrition, there is an equally well-documented lack of skills, knowledge, and confidence of physicians in their ability to effectively counsel patients to change eating patterns.[9–12] In addition to the education-related determinants of physicians' nutrition behavior,[13–20] several system factors affect nutrition behavior in the primary care setting, such as lack of supportive office systems and organization, perceived lack of time, and lack of payment and referral sources and materials.[21–25]

To assist primary care physicians in improving their practice behaviors related to nutrition and cancer prevention, the National Cancer Institute (NCI) developed a manual on nutrition in primary care (referred to as "the manual" in this article).[26] The manual was modeled after the NCI publication, *How to Help Your Patients Stop Smoking: A National Cancer Institute Manual for Physicians*.[27] The manual was designed to address physician-related determinants of nutrition behavior, such as knowledge of cancer and nutrition and brief counseling techniques, as well as system-related determinants, such as office organization, material resources, and staff training. The manual includes the following components: (1) the rationale for nutritional assessment and intervention by primary care physicians; (2) the rationale for and the mechanisms of organizing the office environment, office staff, and physical setting in a way that will help patients improve their eating habits; (3) advice on how to screen patients' current eating habits and diet-related cancer risk factors; (4) advice on how to plan effective interventions, such as providing dietary advice and follow-up to help patients successfully improve their eating habits; (5) advice on when and how to make referrals to dietitians or other related health professionals; (6) tip sheets and articles for patients including ethnic minorities; and (7) samples of government nutrition education materials. Although the manual stresses the role of nutrition in cancer prevention, its recommendations and educational material are consistent with the role of nutrition in the prevention of major chronic diseases.

This article reports on the results of a randomized study to determine the effectiveness of two strategies for promoting the use of the manual in improving physician and office staff nutrition-related behavior, especially in connection to cancer prevention. One strategy was to train a physician in the practice using an interactive tutorial. The other strategy was to simply mail the manual to a physician in the practice. We hypothesized that practices with a physician who participated in the in-person tutorial would engage in more nutrition-related behaviors in the areas of office organization, screening, advice/referral, and patient follow-up, than practices that were not offered the tutorial.

METHODS

Study Design

The study design consisted of a random assignment of primary care physician practices recruited from Pennsylvania and New Jersey to one of three intervention groups: (1) the *training group*, in which practices were offered one interactive in-person tutorial on how to use the manual; (2) the *manual-only group,* in which practices were mailed the manual with no training offered; and (3) the *control group*, in which practices were not given any intervention. Each randomized practice designated a physician, who could have been a senior or junior member of the practice, as the key participant in the study at the time of recruitment. The designated physician was asked to transmit the information to the rest of the practice members. Thus, the study unit was the practice itself, not any single physician within the practice. In a postintervention period, each practice was evaluated in a face-to-face follow-up interview with the key participant regarding the adoption of the nutrition-related behavior recommended in the manual. Figure 1 is a flow diagram of the overall study design and gives sample sizes at each stage of recruitment, randomization, intervention, and follow-up.

Recruitment and Randomization of Practices

The practices were recruited from 21 counties in Pennsylvania and 7 counties in northern and central New Jersey where there were high population densities. Telephone screening of the American Medical Association directory was used to determine that approximately 3,000 practices were eligible for recruitment into the study. A practice was eligible if it was an office-based private practice and had one or more physicians who practiced in internal medicine, family medicine, or general practice, who spent at least 50% of their time in primary care, and who planned to remain with the practice through July 1994. Eligible practices were contacted by mail and invited to participate in a study of a cancer risk reduction program (nutrition training was not mentioned). For participating, the physicians were offered continuing medical education (CME) credit from the state medical society and the American Academy of Family Physicians. A precondition for receipt of CME credits was receipt of the intervention through a tutorial or by self-study of the manual and completion of the face-to-face follow-up interview. In a telephone follow-up to the mailed invitation, a total of 972 practices agreed to participate in the study, of which a random subsample of 810 practices was selected. During the telephone follow-up, one eligible physician was designated by each participating practice to be given the assigned intervention.

After recruitment, study practices were linked into triads in which each practice was randomly assigned to a different intervention group, resulting in approximately 270 practices being assigned to each intervention group (see Fig. 1). Each triad had practices with similar size, type, and location to ensure a level of balance between the groups. Also, the formation of the triads helped to maintain comparability among the groups in the length of the exposure period. For the practices in the same triad, a manual was mailed to the manual-only practice the day after the designated physician from the training group practice attended the tutorial, and an interim reminder letter was mailed to the control group practice at this same time. Training group physicians that failed to arrive for the tutorial were mailed a manual. The follow-up interviews for the practices from a

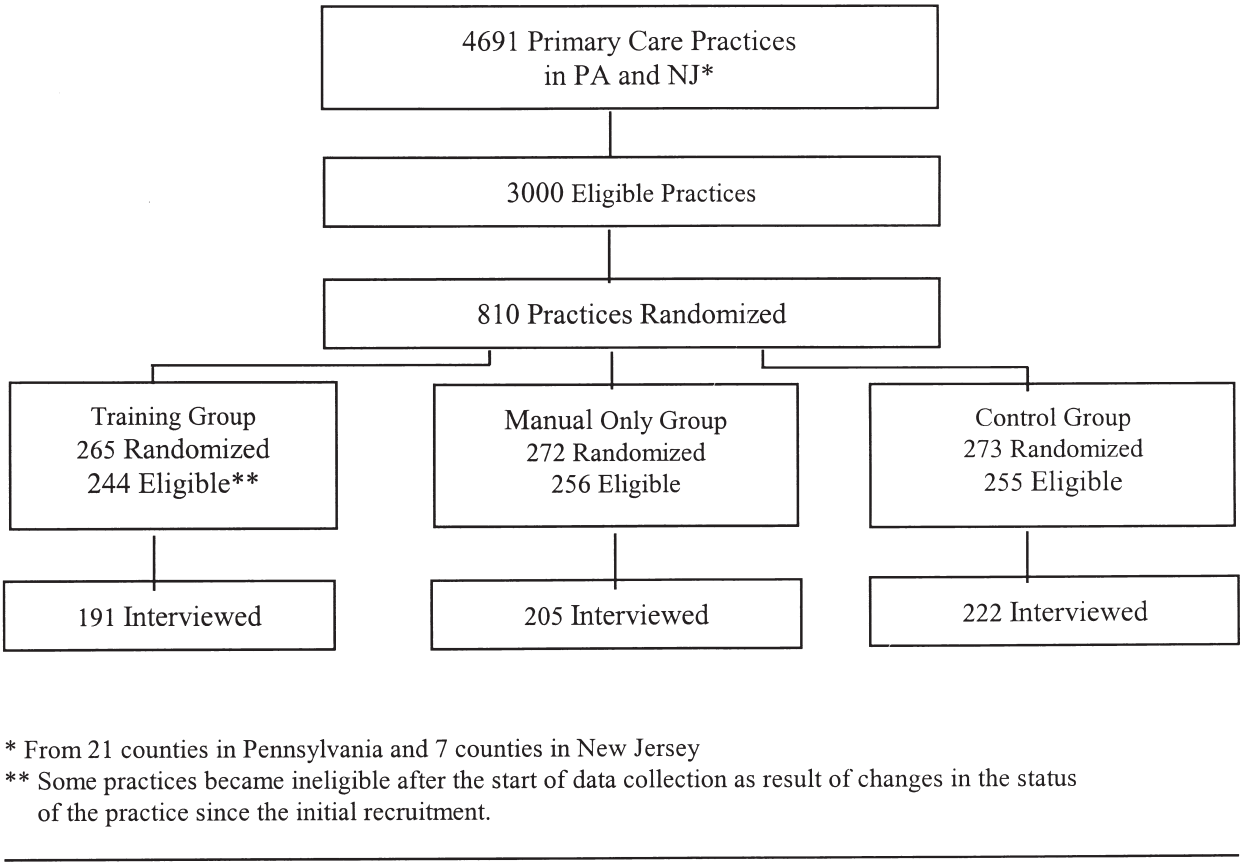

FIGURE 1. Study overview. *From 21 counties in Pennsylvania and 7 counties in New Jersey. **Some practices became ineligible after the start of data collection as a result of changes in the status of the practice since the initial recruitment.

triad were conducted at the same time, which was 4 to 6 months after the intervention. The designated physicians in the control group practices were mailed the manual at the conclusion of the study with instructions on how to apply for CME credits after reading the manual.

Between the time of randomization and data collection, 55 practices became ineligible to be in the study, leaving 755 study practices. The primary reasons for ineligibility were that the practice closed indefinitely or no longer performed primary health care.

The sample size of 270 practices for each intervention group was selected to detect a 12% difference in the rate of nutrition counseling between the groups with a power of 80% and a two-sided type I error of 5%. This calculation was based on an assumed baseline rate of 20% of the practices offering nutrition counseling and a dropout rate among study practices of 20%.

The Training Intervention

The training intervention was designed as a "train-the-trainer" workshop exposing participants to all the components of the nutrition manual. Each 3-hour training session included four modules. The first module was designed to help participants verbalize their attitudes about nutrition counseling in general and for cancer prevention, in particular, and to identify the barriers in providing nutrition counseling to patients in the office setting. The guided discussion focused on ways of overcoming identified barriers. This was followed by a didactic presentation and hands-on exercise on how to do simple nutrition screening and set nutrition priorities for patients based on the screening results. The subsequent module focused on a system's approach to nutrition counseling, which included a didactic presentation on how to organize the office environment to focus on and support nutrition-related behavioral changes. The third module was designed to teach nutrition counseling skills and was modeled on the "6-step method" for behavior change.[28] Role-playing simulations with written scenarios for each nutrition counseling strategy were included in the training for all participants. The last module was designed to help each participant develop an action plan to be implemented upon his/her return to the practice. This plan included a mechanism for transmitting the information learned in the workshop to the remaining practice partners and office staff. At the conclusion of this module each participant developed a step-by-step process for implementation of the plan.

Five physician instructors were trained to deliver the 3-hour tutorial. The tutorials occurred within 4 to 8 weeks of randomization, and no monetary compensation was offered to participants. The number of participants in each tutorial ranged from 2 to 10.

Evaluation Instruments and Procedures

The designated physician and a designated office staff member, who was chosen by the practice as the one most responsible for office organization related to nutrition, were given face-to-face interviews during the postintervention period. This interview occurred at about the same time for each practice in a triad, which was about 4 to 6 months after the intervention. The face-to-face interviews used structured, pretested interview instruments designed to evaluate the practice's adoption and implementation of the manual's recommendations. The evaluation instruments included two components: questionnaires about the designated physician's and designated staff member's self-reported nutrition-related beliefs and activities, and an observational instrument that included documentation of specific office organization recommendations. The observational component was recorded by the interviewer by visually verifying the use in charts and the stock of the following items: nutrition posters, bulletin boards, dietary assessment forms and tools (e.g., eating habits screening instruments and body mass index nomogram), advisory tools (e.g., patient education materials), and follow-up tools (e.g., reminder notes). The interviewers were blinded to the intervention group assignments of the practices.

Table 1. Summary of Evaluation Items Used to Construct Scores

Office organization score
Availability of dietitian in office (full-time/part-time)
List of community referral resources
Staff designated to organize/order materials, tools
Availability of follow-up tools
Space for storage and display of materials/tools
Use of office nutrition posters/bulletin boards
Nutrition screening score
Percent of patients receiving nutrition screening
Percent of patients completing dietary screening
Staff designated to assist patients in nutrition screening
Use of specific nomograms
Use of nutrition risk factors flow sheets
Use of "at-a-glance" chart marker for nutrition risks
Nutrition advice/referral score
Percent of patients receiving chronic disease nutrition advice
Percent of patients receiving cancer prevention advice
Percent of patients receiving "healthy eating" advice
Percent of patients given dietary advice during routine physical
Percent of "at risk" patients given dietary advice (specific dietary recommendations, short-term goals, exercise program, review of materials)
Percent of "at-risk" patients referred to nutrition specialists
Use of educational materials in counseling (cancer, healthy eating)
Referral list for nutrition resources
Use of "nutrition prescriptions"
Patient follow-up score
Percent of "at-risk" patients scheduled for follow-up
Percent of "at-risk" patients encouraged with calls, letters
Use of personalized nutrition follow-up letters
Use of nutrition notices in invoices/follow-up letters
Use of "follow-up" patient lists

Measurements and Statistical Methodology

The items on the evaluation instruments are grouped into the four areas, which are emphasized in the manual (Table 1). Adherence scores were created to measure the level of compliance to the nutrition manual in the following areas: (1) the extent to which the office was organized to provide nutrition information and promote nutrition-related activities (office organization); (2) the extent to which the practice performed nutrition screening (nutrition screening); (3) the extent to which the practice provided nutrition advice or referral for their patients (nutrition advice/referral); and (4) the extent to which the practice supported and monitored patients in making changes in their nutrition-related behaviors (patient follow-up).

The responses to the items on the evaluation instruments used in the scores were transformed into values ranging from 0 to 1, where 0 = never, none, no, or 0%, and 1 = always, all, yes, or 100%, indicating the level of adherence to the recommendation represented by the items. The adherence scores were computed by first summing together the values of their component items, yielding values with ranges of 0 to 12 for office organization, 0 to 22 for nutrition screening, 0 to 13 for nutrition advice/referral, and 0 to 5 for patient follow-up. The maximum values for these ranges can be greater than the number of items listed in Table 1 because some of the listed items represent multiple items on the evaluation instruments. Finally, the adherence scores were computed as a percentage of the maximum possible value for the summed items. For example, an office organization adherence score of 29% for a practice means that the practice complied with about 29% of the NCI manual's recommendations for proper organization of the office for providing nutrition information and promotion of nutrition-related activities.

Demographic information regarding the socioeconomic and medical case mix of patient populations as well as demographic and self-assessed nutrition education of the physician was collected in the physician interview.

The response rates to the face-to-face interview differed by type and size of the study practices. To adjust the analyses for potential bias due to the differential response

rates, the observations used in the analysis of this study were weighted by the reciprocal of the interview rates.[29]

In the primary analyses the "intent-to-treat" approach was used. Thus, all practices in the training group, regardless of attendance at the tutorial, were included in the analysis.[30] In secondary analyses, the practices in the training group that attended the tutorial, referred to as *compliant training group*, were analyzed as a separate group.

T tests were used to determine the statistical significance of differences between the intervention groups. The statistical analyses were conducted using SUDAAN (Research Triangle Institute, Research Triangle Park, NC, 1995). All tests of significance were two-tailed at the 5% level.

RESULTS

Practice and Patient Characteristics

The three intervention groups were similar with respect to the designated physicians' gender, ethnicity, prior nutrition education, and training in nutrition counseling (Table 2). Thus, the groups remained comparable, despite differential interview rates among them. Only about 50% of the eligible practices had representatives who attended the training sessions (120 practices out of 244). The most frequently cited reason for not attending was a "medical emergency."

The practices did not differ with respect to sociodemographic and medical characteristics of their patient populations (data not shown). Practices reported that among their patients the mean proportion with low income was 15%; low literacy, 10%; uninsured status, 5%; Medicare, 42%; Medicaid, 8%; and diseases for which dietary advice was indicated, 49%.

Adherence Scores

The training group was 28.5% adherent to the NCI manual's recommendations for office organization, which was higher by 3.8% than the manual-only group (P = .005) and by 5.5% than the control group ($P < .001$); see Figure 2. The training group was 23.5% adherent to nutrition screening, which was higher by about 2.5% than the manual-only group (P = .046) and 3% than the control group (P = .012). The differences between the manual-only and the control groups for the organization and nutrition screening adherence scores were not statistically significant. There were no statistical differences among the three intervention groups for the nutrition advice/referral or patient follow-up scores although the practices were more than 50% adherent for providing nutrition advice/referral but less than 15% adherent for patient follow-up.

Selected items that composed each adherence score were analyzed to pinpoint tools and recommendations that had higher adoption rates. Figure 3 displays results for those items for which intervention group differences were statistically significant. The proportion of training group practices that used nutrition screening forms was more than 2 times greater than the manual-only group and 5 times greater than the control group (17.3% vs 6.7% and 3.2% with P = .001 and $P < .001$, respectively). Nutrition posters appeared in practice offices about 1.5 times as often for the training group as the manual-only group and 2 times as often for the training group as the control group (24.5% vs 15.9% and 12.5% with P = .035 and P = .003, respectively). Although only 6.2% of the training group practices used nutrition notices in patient invoices, this was significantly larger than the 0.9% and 1.4% rates among the manual-only and control group practices (P = .004 and P = .014, respectively). The pro-

Table 2. Number and Percentage of Designated Physicians, by Intervention Group and Characteristics of Physicians Reported in the Face-to-Face Interview*

Physician Characteristics	Training Group, *n* (%)	Compliant Training Group,† *n* (%)	Manual Only Group, *n* (%)	*Control Group, n* (%)	*Total,*‡ *n* (%)
Prior MD nutrition training					
Yes	103 (54.2)	63 (56.2)	114 (56.2)	120 (54.3)	337 (54.9)
No	87 (45.8)	49 (43.8)	89 (43.8)	101 (45.7)	277 (45.1)
Prior MD training in nutrition counseling (by self-report)					
Yes	43 (22.8)	27 (24.1)	45 (22.2)	51 (23.1)	139 (22.7)
No	146 (77.3)	85 (75.9)	158 (77.8)	170 (76.9)	474 (77.3)
Gender					
Male	158 (83.2)	92 (82.1)	168 (82.0)	184 (83.3)	510 (82.8)
Female	32 (16.8)	20 (17.9)	37 (18.0)	37 (16.7)	106 (17.2)

**Physician and staff questionnaires were completed in the face-to-face interview by 191 practices in the training group (112 practices in the compliant training group), 205 practices in the manual-only group, and 222 practices in the control group. The failure of the numbers to sum to these totals in the above categories is due to nonresponse for the selected items in the physician questionnaire.*

†*The compliant training group includes only those practices in the training group that attended the tutorial.*

‡*Total is the sum of the training, manual-only, and control groups.*

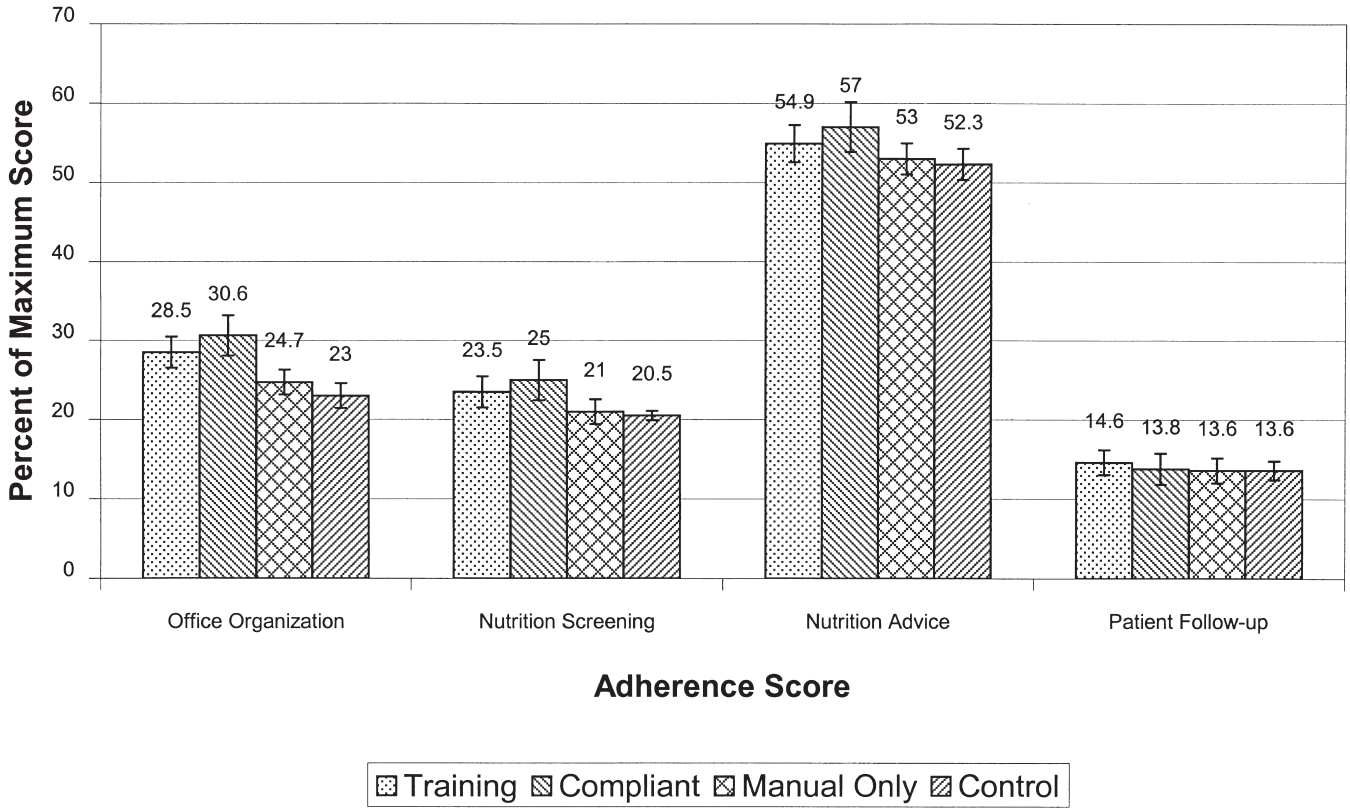

FIGURE 2. Mean adherence scores and 95% confidence intervals. Numbers over bars are mean adherence scores.

portion of practices with staff who helped patients complete nutrition self-assessment forms was about 2 times greater for the training group than for the manual-only group and about 4 times greater for the training group than for the control group (8.8% vs 3.9% and 1.8% with $P = .05$ and $P = .002$, respectively). The training group staff provided patients with nutrition materials for problems identified in the assessment form about 3 times more often than either the manual-only group or the control group staff (14.1% vs 4.8% and 4.2% with $P = .002$ and $P < .001$, respectively).

As a further examination of the effectiveness of the training, we analyzed those practices in the training group that were compliant by having a representative who attended the tutorial. These compliant training group practices were found to be similar to the training group practices with respect to practice characteristics (see Table 2). The office organization, nutrition screening, and nutrition advice scores were larger for the compliant training group than the training group (Fig. 2). In fact, unlike the training group, the compliant training group had a significantly larger nutrition advice score than either the manual-only group ($P = .037$) or the control group ($P = .012$). However, there was no demonstrated difference in the patient follow-up score between the compliant training group and the manual-only and control groups. In general, when examining the selective items in Figure 3, the compliant training group followed the guidelines of the nutritional manual to a greater extent than did the training group.

DISCUSSION

In this randomized study with both observational and self-reported data, an in-person tutorial seemed to make physicians and their staff more likely to adopt instruments and tools for nutrition screening and to organize their office environment to be more conducive to providing dietary advice for patients. Surprisingly, these results were accomplished by extraordinarily busy physicians who were trained for only 3 hours and used materials that were free publications or available at a minimal cost. The training, however, did not seem to have a significant impact on nutrition advice/referral or patient follow-up procedures, which are important parameters in achieving long-term sustained dietary changes in the patient population. We were encouraged by the use of nutrition-specific follow-up notices that some training group practices included in the patient's invoices.

This study has several limitations. Attendance to the tutorial was only about 50%; greater participation might have resulted in larger beneficial effects for the training group. The training intervention occurred once and there was no reinforcement. We measured only its short-term (6 months) impact. This study was not designed to evaluate

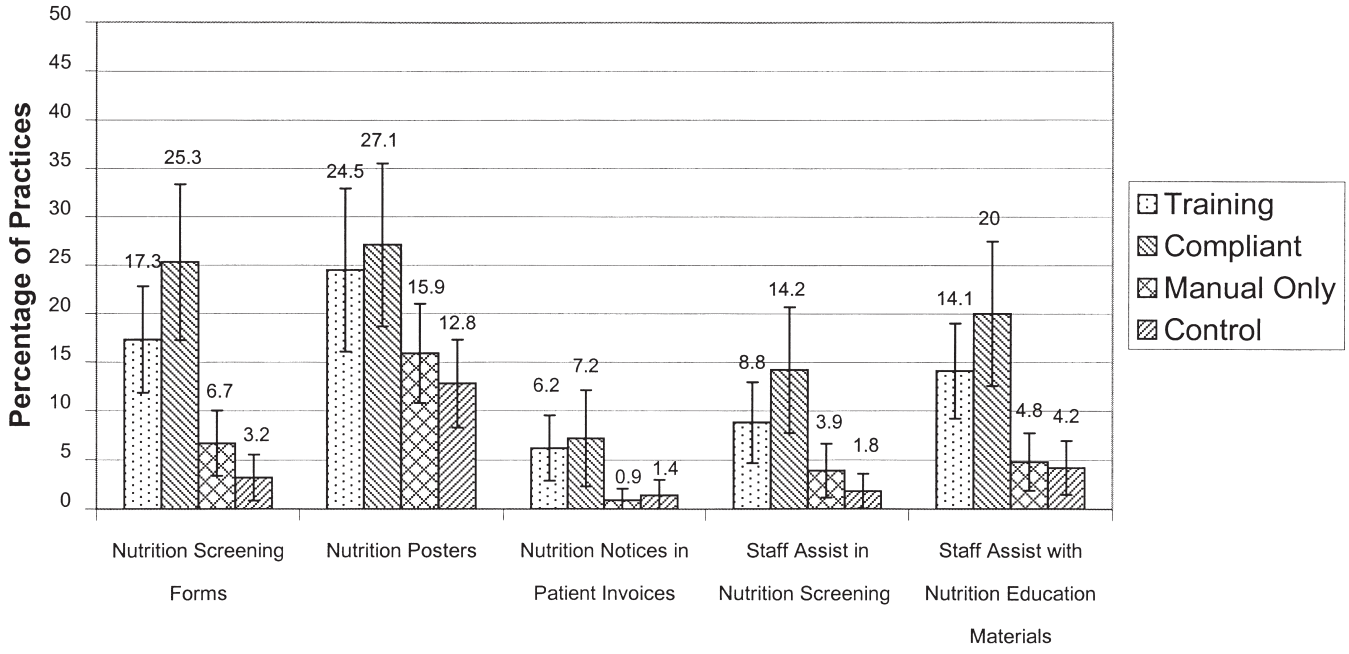

FIGURE 3. Percentage of practices following specific recommendations of the National Cancer Institute manual with 95% confidence intervals. Numbers over bars are percentages of practices following recommendations.

the impact of the training intervention on the patients' nutrition-related behaviors, but rather to measure changes in the physician's behavior. This is the necessary first step in evaluating whether patient nutrition-related behavior can be changed through primary care physicians. A subsequent study could thus focus on evaluating whether the successful adoption of the manual's recommendation (i.e., changes in the physician nutrition-related activity) affects the patient's nutrition-related outcomes, as has been demonstrated by the recently published WATCH project.[31,32] Finally, the sample of practices in this study came from two states, and their nutrition-related behavior patterns may not reflect national patterns.

Physicians participating in all three groups of this study indicated that they sorely lack training in nutrition counseling. Only about 23% reported that they had received training anytime in their career on how to perform nutrition counseling.

Significant reductions in disease related to diet could be accomplished by simple dissemination and application of existing knowledge, skills, and tools already shown to affect patients' diet-related behavior and outcomes.[33–36] In this respect, primary care physicians have an important role to play as demonstrated by recently published studies.[31,32] Physician educators have the challenge of enhancing the dissemination to practicing physicians of technologies for performing nutrition screening, advice, and referral. The tutorials described in this article, along with the use of the manual, seem to be an effective channel for the dissemination of knowledge and techniques to improve the nutrition assessment activities of primary care physicians. This challenge can best be accomplished by the cooperative efforts of professional organizations responsible for the continuing education of primary care physicians and professional organizations of nutrition health professionals to offer joint CME courses modeled after the training tutorials reported in this article. The usually cited barriers of lack of time and lack of reimbursement[12,31] did not seem to obstruct the physicians from adopting in their routine office practices some components of the nutrition recommendations given in the manual.

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